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ADVISORY NOTICE

No. 08-001

SUBJECT: Continuous Positive Airway Pressure (CPAP)

ISSUED: 23 January 2008

Biphasic Defibrillators

In response to recent inquiries, the D red the following guidance on prehospital use of Continuous Positive Airway Pressure information is intended to supplement the current *Rhode Island Prehospital Care Proto*. This document is not intended to provide comprehensive instructions in use of ined specifically on the equipment they will use in accordance with manufacturers' reco sponsible for proper use.

The Division of EMS regulates the EMS system in Rhode Island through a variety of means, including the *Prehospital Care Protocols and Standing Orders*. Invasive and high-risk interventions are highly regulated. Adjuncts to patient care are generally a lower priority for regulation, but may become highly regulated if there are significant patient risks, complexity, issues of standardization or other concerns. While CPAP is not presently included in the Rhode Island protocols, it is anticipated to be added in the near future. In the interim, the Division of EMS considers CPAP a basic airway adjunct and permits its use by Rhode Island EMTs properly trained on the equipment used by their service.

Overview

Continuous Positive Airway Pressure (CPAP) is a noninvasive tool for providing respiratory support through a tight-fitting mask rather than an endotracheal tube or other advanced airway. It works by using positive pressure to keep pharyngeal structures from collapsing after expiration. Used for some time in the hospital setting (and in treating sleep apnea), recent studies have demonstrated CPAP's prehospital efficacy and its use by EMS has been steadily growing over the past ten years.

CPAP is used for conscious patients with congestive heart failure (CHF) and some other conditions such as asthma and COPD. Patients must be able to maintain their own airway. CPAP has been shown effective in either delaying or eliminating the need for intubation while alleviating the patient's acute distress. Concurrent benefits of CPAP include increased oxygenation, decreased respiratory and heart rates, and decreased systolic blood pressure. CPAP carries fewer risks than endotracheal intubation and requires less training/practice to use.

CPAP should not be confused with BiPAP which functions on a similar principle but provides different pressure levels for inspiration and expiration. BiPAP is not typically seen in the prehospital setting, as the equipment is bulkier and more expensive.

Action

For treating patients with pulmonary edema secondary to congestive heart failure, CPAP increases lung pressure and acts to hold open collapsing alveoli, increase oxygen transfer, and push interstitial fluid out of the alveoli.

For patients with COPD and asthma, CPAP overpowers the residual pressure that prevents the lungs from fully emptying on exhalation. This decreases the patient's workload and increases oxygenation. CPAP also increases the effectiveness of nebulized medication delivery.

It is important to recognize that CPAP is not a ventilator and does not provide artificial respiration for the patient. It is designed to support the patient's airway through positive pressure and to increase the effectiveness of the patient's own respirations. If the patient has ineffective respirations, CPAP should not be used; assist ventilations with other adjuncts such as bag-valve-mask.

Equipment

CPAP equipment varies among manufacturers. A typical prehospital setup consists of an oxygen-powered "flow generator", a tight fitting soft-seal mask, and connective tubing between the two. A bacteria filter and PEEP valve may be included as part of a pre-packaged kit and a nebulizer may be fitted in line with the connective tubing (a separate 0_2 supply is required.)

The flow generator typically has a variable flow rate of 10 to 140 L/min and a variable "fraction of inspired oxygen" (FiO_2) of 35-95%. In other cases, the CPAP pressure is created and maintained by oxygen flow alone, and is varied by changing the liter flow rate of oxygen. CPAP normally maintains a pressure of 2.5-5 cm/H_2O and pressures over 10 cm/H_2O have been associated with a risk of barotrauma (see *Adverse Effects* below.)

Equipment should include an anti-asphyxiation provision as well as an over-pressure release mechanism for patient safety.

Indications

CPAP is indicated in adult patients with moderate to severe respiratory distress caused by CHF, asthma, or COPD only. Patients must be fully conscious/alert and able to maintain their own airway. It is not indicated for mild asthma or COPD exacerbations that can be treated promptly and effectively with medication.

Contraindications

CPAP is contraindicated in patients with hypoventilation, altered/diminished level-of-consciousness, or any potential airway compromise (such as vomiting, burns, foreign body aspiration, choking, etc.) It is also contraindicated in patients with known single-lung disease such as cancer of one lung, patients with dyspnea after trauma, and patients with known pneumothorax.

Adverse Effects

The most frequent complication of CPAP is anxiety in patients who have not used the device before. The mask used for CPAP may feel overly confining or obstructive to some patients. Overcoming this challenge requires some coaching before application and may preclude using CPAP for patients who will not tolerate it. Other theoretical side effects (not actually demonstrated in current studies) include hypotension and pneumothorax (caused by increased intrathoracic pressure) and gastric distension. EMTs should remain alert to these possibilities when using CPAP.

References

Hubble, Michael et al. Effectiveness of Prehospital Continuous Positive Airway Pressure in the Management of Acute Pulmonary Edema. *Prehospital Emergency Care*. 2006 Oct/Dec; 10(4): 430-439.

Sullivan, Robert J. Prehospital Use of CPAP [Electronic version]. *Emergency Medical Services*. 2005 Aug.

Essentials of Paramedic Care (Second Edition). Bledsoe, B., Porter, R., Cherry, R. Brady/Prentice Hall, 2007.

For any questions or concerns regarding prehospital use of CPAP, please contact our physician consultant, Dr. Ken Williams, at kwilliams@lifespan.org or contact the Division of EMS at (401) 222-2401.